Claims:

1. A method of how to operate a fuel cell system (1, 15) which comprises at least one active membrane (2) sandwiched between an anode layer (4) and a cathode layer (3) and comprising a catalyst, and a fuel supply having access to the anode layer and an air supply (17, 18) having access to the cathode layer, wherein the air supplied by the air supply is introduced by pressure into the fuel cell system, passes along the cathode layer and then leaves the fuel cell system, and is used for both oxidant and coolant, characterized in that the air is introduced into the fuel cell system (1, 15) with a rate resulting in a stoichiometric rate in the range between 25 and 140.

2. Method according to claim 1, characterized in that the stoichiometric rate is in the range between 45 and 90.

3. Method according to claim 1 or 2, characterized in that the air flow direction within said fuel cell system (15) is alternatingly reversed after certain time spans.

4. A fuel cell system adapted to be operated according to the method of any of claims 1 to 3, the fuel cell system (1, 15) comprising at least one active membrane (2) sandwiched between an anode layer (4) and a cathode layer (3) and comprising a catalyst, and a fuel supply having access to the anode layer and an air supply (17, 18) having access to the cathode layer, characterized in that the cathode layer(s) (3) or a part of the cathode layers is equipped with air penetrating ducts allowing an air flow parallel to the membrane (2) at a flow rate resulting in a stoichiometric rate in the range between 25 and 140.

5. Fuel cell system according to claim 4, characterized in that the air penetrating ducts are formed in an air conducting layer (10) which is adjacent and in contact to the cathode layer (3), the latter one having diffusion properties.

6. Fuel cell system according to claim 4 or 5, characterized in that the air penetrating ducts consist of channels (11) formed in the cathode layer (3) or in the air conducting layer (10) and extending along the air flow path.

7. Fuel cell system according to claim 6, characterized in that in the flow direction, the total of the channel (11) section area decreases.

8. Fuel cell system according any of claims 4 to 7, characterized in that it comprises a fuel cell stack which has a geometrical form of a parallelepiped with a rectangular traverse section wherein the air penetrating ducts (10) of each single cell (1) are directed parallel to the short edge of the rectangle.

9. Fuel cell system according any of claims 4 to 7, characterized in that it comprises a fuel cell stack (15) which has a geometrical form close to a cylinder, and has individual cells (1) each comprising an active area in the form of a circular ring, the circular rings in the stack delimiting a central tube (16) within the stack from which tube the air penetrating ducts (10) spread and direct the air flow radially through the individual cells.

10. Fuel cell system according claim 9, characterized in that the air flow is generated by one or two blowers (18) located at one or two endplates (19) of the fuel cell stack (15).

11. Fuel cell system according to any of claims 4 to 10, characterized in that it comprises a fuel cell stack (15) with gas separator plates (5) between the

single fuel cells (1), wherein the material of said gas separator plates has a ratio heat conductivity parallel to the membrane to density of > 0.04 W m^2/(kg K).

12. Fuel cell system according claim 11, characterized in that the material of the gas separator plates (5) is a foil made of expanded graphite.

13. Fuel cell system according any of claims 4 to 12, characterized in that the single fuel cell (1) at its cathode side comprises a diffusion structure wherein an air filter is contained.

14. Fuel cell system according claim 13, characterized in that said air filter is made of a layer sheet material which is strongly hydrophobic and comprises small pore sizes.

15. Fuel cell system according claim 14, characterized in that the material of the air filter is a porous stretched PTFE foil filled among others with an electrically conductive material.

16. Fuel cell system according claim 15, characterized in that the PTFE foil is further compressed and impregnated with a PTFE detergent suspension.